

Wire Separation From the Pilot's Perspective

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Why Are We Here?

- TWA 800
 - Likely cause improper separation of current carrying wires from FQIS system
- Swissair 111
 - Wiring system under scrutiny
- Most visible and recent

Other Incidents and Accidents

- 5/10/85, Monarch Airlines 757, Kapton power feeders chafe and arc. Wire-bundle vaporized. Adjacent wire-bundles damaged.
- 3/17/91. L-1011, Delta Airlines. Flames from the base of the cabin sidewall. Wires burned, 5 C/Bs tripped. Diverted to Goose Bay, Canada.

And More

- 10/8/93. MD-11. Lost ground spoilers. During inspection found numerous burned and chafed wires in the fwd avionics bay.
- 5/19/95. DC-10. C/Bs popped, lost # 1 and 2 generators. Unscheduled landing. Found burnt out wire-bundle in forward cargo ceiling.

Lastly

- 4/28/96. MD-11. Flight arrived with five Avionic C/Bs tripped. Found wire-bundle chafing.
- 12/14/96. 737. During inspection found left wing wire-bundle melted 15 of 32 wires.
- 11/9/98 L-1011 33 multiple systems failures occurred with the autopilot, cabin pressurization, auto spoilers, and thrust reversers due to wire arcing event and fire

So... Arcing Events That Damage Other Wires do Occur

- With regularity

TWA 800 Recs

- Safety Board concludes that existing standards for wire separation may not provide adequate protection against damage from short circuits... the FAA should review the design specifications for aircraft wiring systems of all U.S.-certified aircraft and (1) identify which systems are critical to safety and (2) require revisions, as necessary, to ensure that adequate separation is provided for the wiring related to those critical systems.

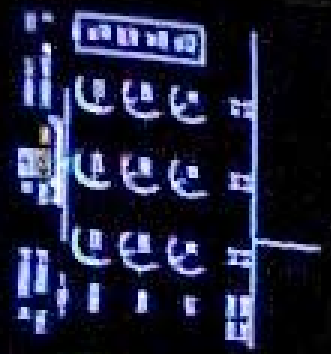
TWA 800 Recs Con't

- Cites a January 9, 1998 UAL 767 incident “in which the flight crew made a precautionary landing at London Heathrow International Airport after experiencing multiple display errors and tripped circuit breakers,... this event damaged dozens of wires, some more than 1 1/2 inches away,”



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EVAC SIGNALING	BATTERY RELAY	LEMER AC & DC	EMER & BATBUS	END FUEL INV PER &	GROUND RETURN
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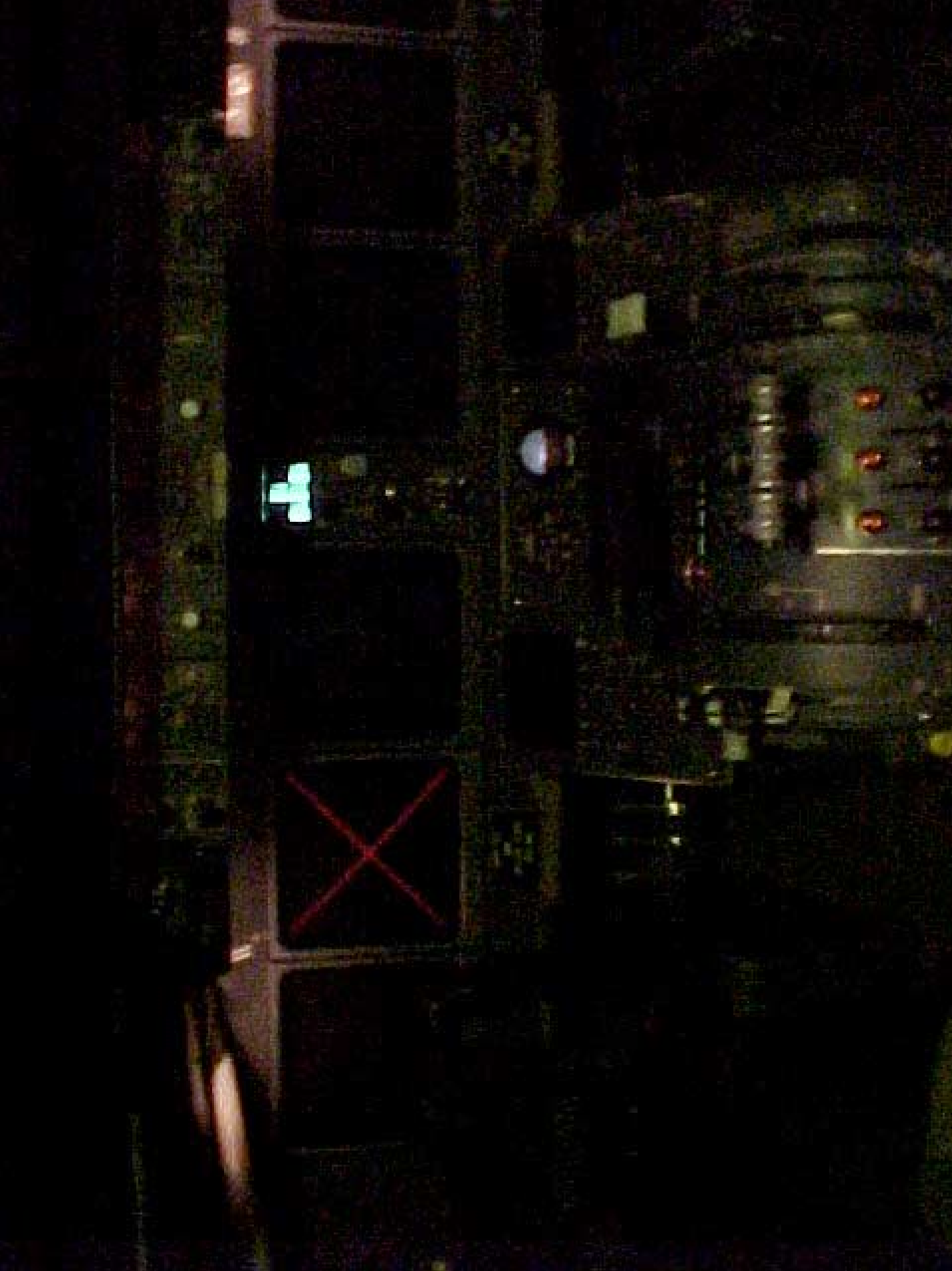
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What Circuits Should Be Separated

- Other than the obvious (flight and engine controls)
- Captain's and F/O's instrumentation
- Navigation
- Pressurization
- Fire detection, suppression
- To name just a few

There is no Substitute for Distance

- Arcing events exceed 7000° C
- Barriers or other means of compliance to distance is dangerous
- Nuclear industry data suggest 2" minimum
- Accident and incident data suggests similar distances
- Present manufacturers vary widely and use anything from nothing to ¼", 2", and up



Do We Need a Hard and Fast Number?

- Possibly not but...
- Whatever is used it should have the dielectric equivalent of 2" of air and if it is something other than distance it should be able to withstand 7000° C for a short period of time

What's Needed

- A performance standard equivalent to a separation distance of 2" (remember the 7000°C caveat)
- Heavy current carrying cables to include all bus power supplies at a minimum
 - All 115VAC and 10-15 amp 24VDC would be even better
- Include redundant circuit separation